DARPA Grand Challenge 2005

Technical Paper Guidelines

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Defense Advanced Research Projects Agency
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Arlington, VA 22203-1714

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Technical Paper Guidelines

Submission of the DARPA Grand Challenge Technical Paper (DGCTP) is a mandatory component of the DARPA Grand Challenge (DGC) 2005 qualification process. Each DGC semifinalist and alternate team is required to submit an acceptable DGCTP to remain eligible for the Grand Challenge. After the conclusion of the event, the DGCTPs will be posted on the DGC web site to enable the sharing of information among teams and to facilitate discussion within the broader technical community.

Teams should conform to the following guidelines to ensure the acceptability of their submission.

Format Guidelines

The paper should be formatted using the layouts and conventions common to published technical papers for a professional, polished appearance. Outlines, checklists, newspaper reports, or magazine articles are not acceptable.

One-inch margins should be used (left, right, top, and bottom) on standard 8.5" x 11" letter size paper. Body text should be 12-point font with 1.5 line spacing. Times Roman or other easy-to-read font may be used for body text, and Arial or other sans serif font for titling. Figures and tables should be incorporated in the text. Papers are expected to be 7-15 pages including cover page and references.

The paper title should include the team name, and "DARPA Grand Challenge 2005" should appear on the title page. Author names may include title and organizational affiliation, as required. Contact information including email address should be included for the corresponding author(s).

The following text must be included on the title page in 10 point type: "DISCLAIMER: *The information contained in this paper does not represent the official policies, either expressed or implied, of the Defense Advanced Research Projects Agency (DARPA) or the Department of Defense. DARPA does not guarantee the accuracy or reliability of the information in this paper.*"

DGCTPs may be submitted in a variety of formats, including Microsoft Word (.doc), rich text (.rtf) and portable document format (.pdf).

Content Guidelines

The paper abstract should contain 100 words or fewer describing the key findings and novel approaches described in the paper. An introduction section may be used to describe the team,

and other important background information. Photographs and diagrams are encouraged. The outline given below is for guidance and is not intended as a complete paper outline.

1. Vehicle Description

1.1. Describe the vehicle. If it is based on a commercially available platform, provide the year, make, and model. If it uses a custom-built chassis or body, describe the major characteristics. If appropriate, please provide a rationale for the choice of this vehicle for the DGC.

1.2. Describe any unique vehicle drive-train or suspension modifications made for the DGC including fuel-cells or other unique power sources.

2. Autonomous Operations

2.1. *Processing*

2.1.1. Describe the computing systems (hardware and software) including processor selection, complexity considerations, software implementation and anticipated reliability.

2.1.2. Provide a functional block diagram of the processing architecture that describes how the sensing, navigation and actuation are coupled to the processing element(s) to enable autonomous operation. Show the network architecture and discuss the challenges faced in realization of the system.

2.1.3. Describe unique methods employed in the development process, including model-driven design or other methods used.

2.2. *Localization*

2.2.1. Explain the GPS system used and any inertial navigation systems employed during GPS outages (as in tunnels). Include a discussion of component errors and their effect on system performance.

2.2.2. If map data was an integral part of the vehicles navigation system, describe the requirements for this data and the way in which it was used.

2.3. *Sensing*

2.3.1. Describe the location and mounting of the sensors mounted on the vehicle. Include a discussion of sensor range and field of view. Discuss any unique methods used to compensate for conditions such as vibration, light level, rain, or dust.

2.3.2. Discuss the overall sensing architecture, including any fusion algorithms or other means employed to build models of the external environment.

2.3.3. Describe the internal sensing system and architecture used to sense the vehicle state.

2.3.4. Describe the sensing-to-actuation system used for waypoint following, path finding, obstacle detection, and collision avoidance. Include a discussion of vehicle models in terms of braking, turning, and control of the accelerator.

2.4. *Vehicle Control*

2.4.1. Describe the methods employed for common autonomous operation contingencies such as missed-waypoint, vehicle-stuck, vehicle-outside-lateral-boundary-offset, or obstacle-detected-in-path.

2.4.2. Describe the methods used for maneuvers such as braking, starting on a hill, or making a sharp turn without leaving the route boundaries.
2.4.3. Describe the method for integration of navigation information and sensing information.
2.4.4. Discuss the control of the vehicle when it is not in autonomous mode.

2.5. *System Tests*
2.5.1. Describe the testing strategy to ensure vehicle readiness for DGC, including a discussion of component reliability, and any efforts made to simulate the DGC environment.
2.5.2. Discuss test results and key challenges discovered.

Teams should not include any information in their submission they do not want released to the public after the completion of DARPA Grand Challenge 2005.

Submission Instructions

The DGCTP must be submitted to grandchallenge@darpa.mil as an email attachment to arrive before 5:00 PM EDT on August 29, 2005 (note that this is two weeks later than the deadline published in the DGC rules). DARPA will reply via email acknowledging receipt of the DGCTP. All papers will remain confidential until after the conclusion of the DGC, at which time DARPA may post any or all papers on the Grand Challenge web site.

DGCTPs that do not conform to the above guidelines will not be accepted.

Copyright

DARPA shall have Government purpose rights in the technical paper until October 9, 2005, at which time DARPA shall have unlimited rights, as stated in the Participation Agreement.

Contact

Questions regarding the DGCTP should be addressed to grandchallenge@darpa.mil.